Calorimeter Calibration

"There is always room for improvement,

BUT: it's not as bad as you think!!"

Thanks to everyone from the CALOP & CALGO group who contributes in this effort!

Too bad the collaboration meeting is now!

principle of calorimeter calibration

cell-level calibrations:

- **subtract pedestals and apply 0-suppression**
- **calibrate the electronics using the pulsers:**
  - **Non-Linearity-Corrections for SCA's**
  - **gain-corrections**
  - **timing and response corrections**
- **intercalibration of the calorimeter cell-response in phi**

physics object calibrations:

em-objects: "geometry dependent corrections" (dead materials)

absolute scale (Z→ee, J/Psi→ee)

jets: jet energy scale

met: everything + muons + unclustered energy corrections

situation in p14/p17

- offline 0-suppression used a pedestal file from summer 2002

➔ use pedestal from DB

- nlc/gain calibration coefficients from run 146225

➔improved fit procedure

➔use >20 different electronics calibrations set

- no timing/response corrections

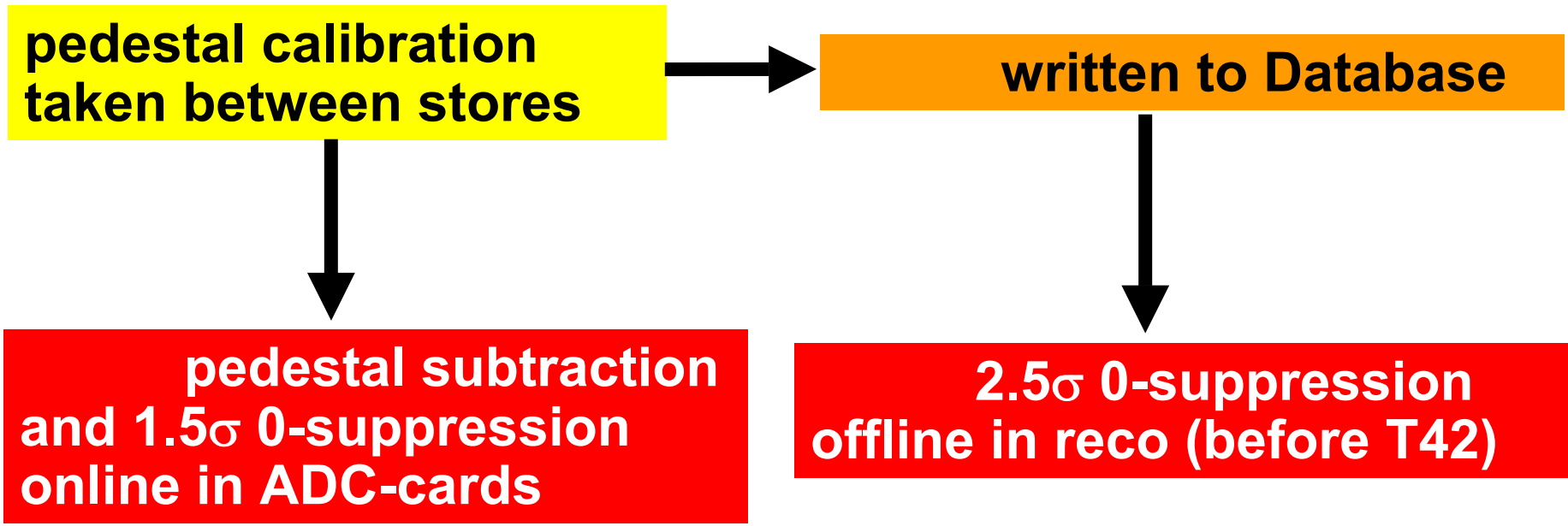
➔derived 1 set of correction coefficients

- no interphi-calibration on the cell-level

➔determined from special run taken before the shutdown

(see: Jan's talk at the Collaboration Meeting on Sept 24)

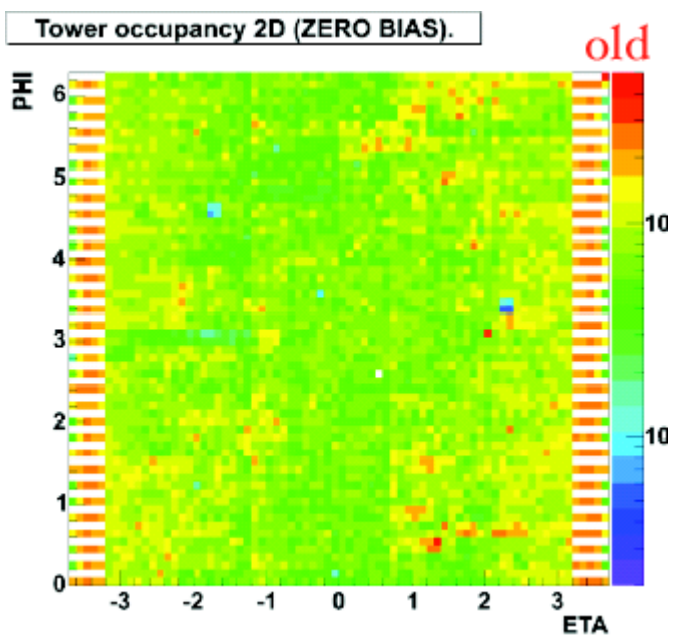
pedestal calibration

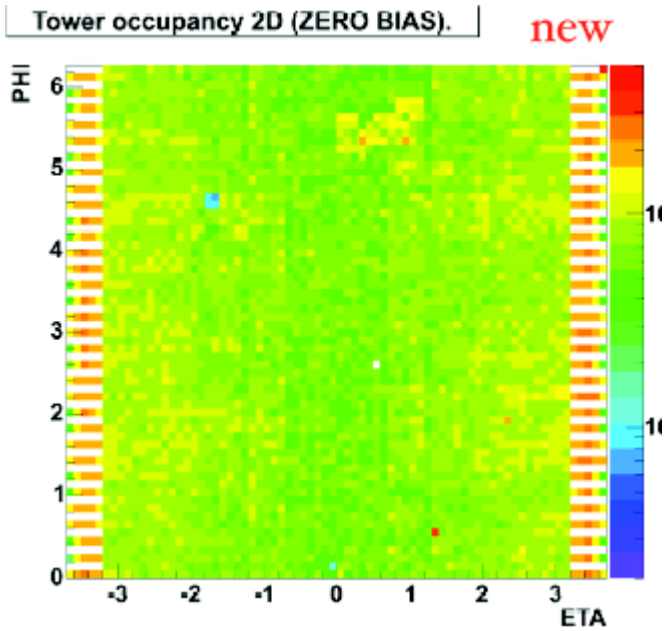


- only cells after the 2.5 σ cut stored in the calDataChunk and available beyond the raw-data files

→ crucial for reprocessing to have the correct 0-suppression thresholds!

effect of pedestals





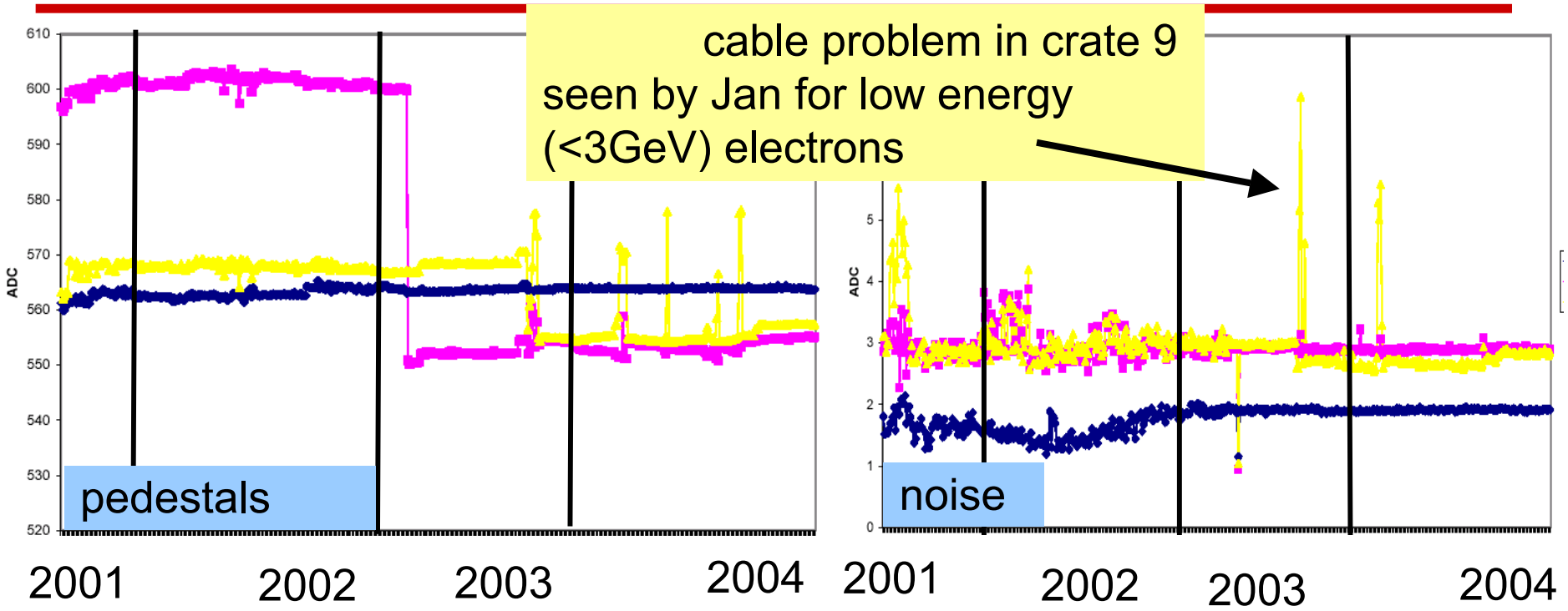
Slava Shary
Silke Nelson
Robert Zitoun

- occupancy distributions from online-monitoring (dq-calo) with historic and current pedestals
- hot/cold zones get cleaned up by using correct 0-suppression thresholds

➔removes inconsistency of between online/offline 0-suppression

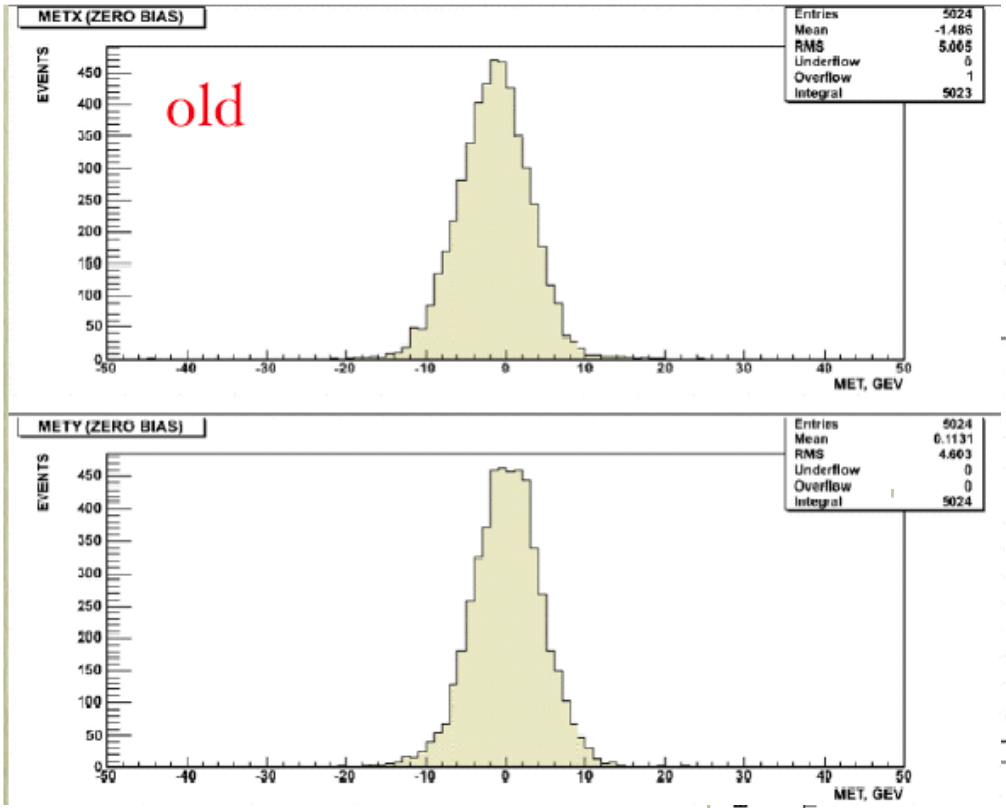
➔takes into account for hardware changes

pedestal stability

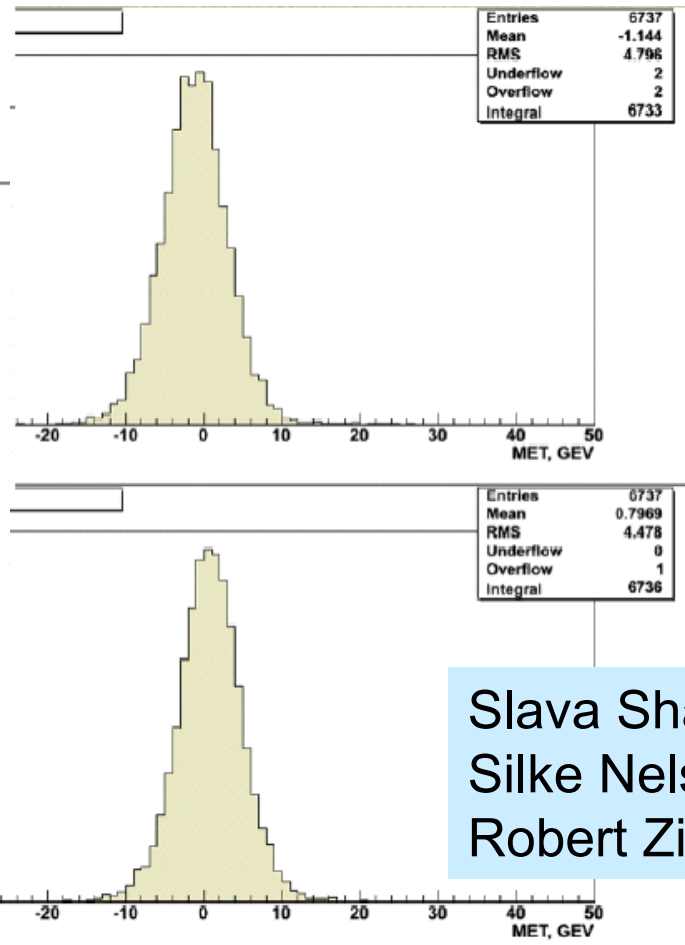


- in general pedestals are very stable over time!
- sigma of noise distribution for em-channels vary within 1 ADC count
- spikes show real hardware problems

pedestals and MET



MET resolution improves by ~5%

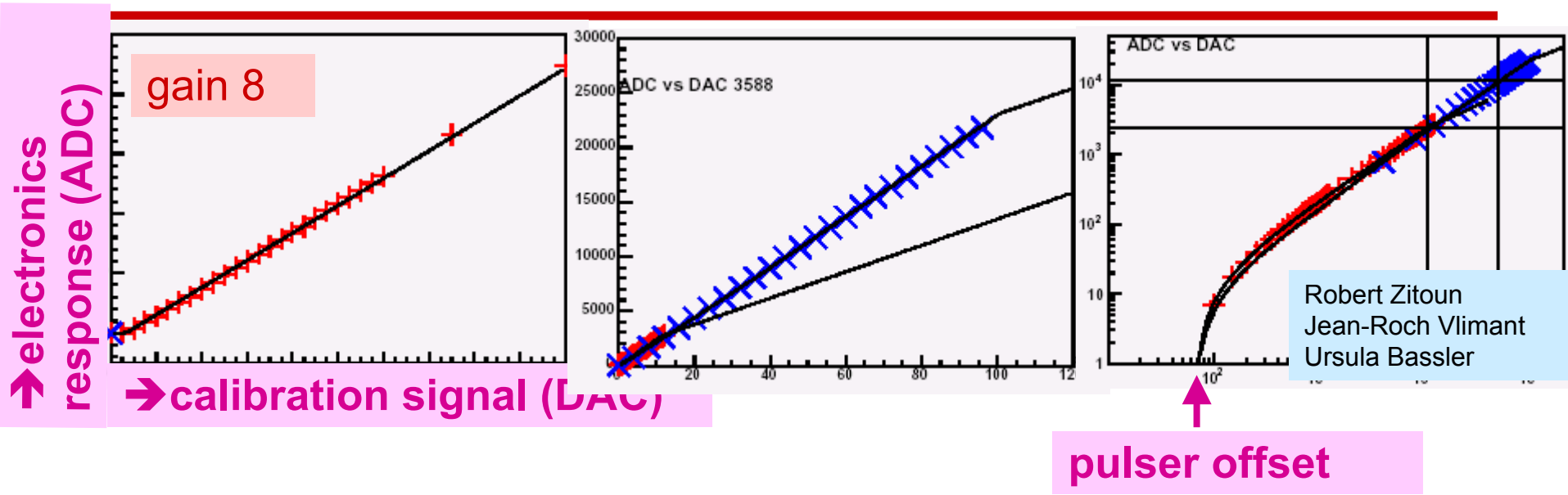


0-bias events

dq-calo: reconstruction with p14 only pedestal-file changed

Slava Shary
Silke Nelson
Robert Zitoun

pulser calibration



AIM: Corrections for channel-by-channel differences in electronics response

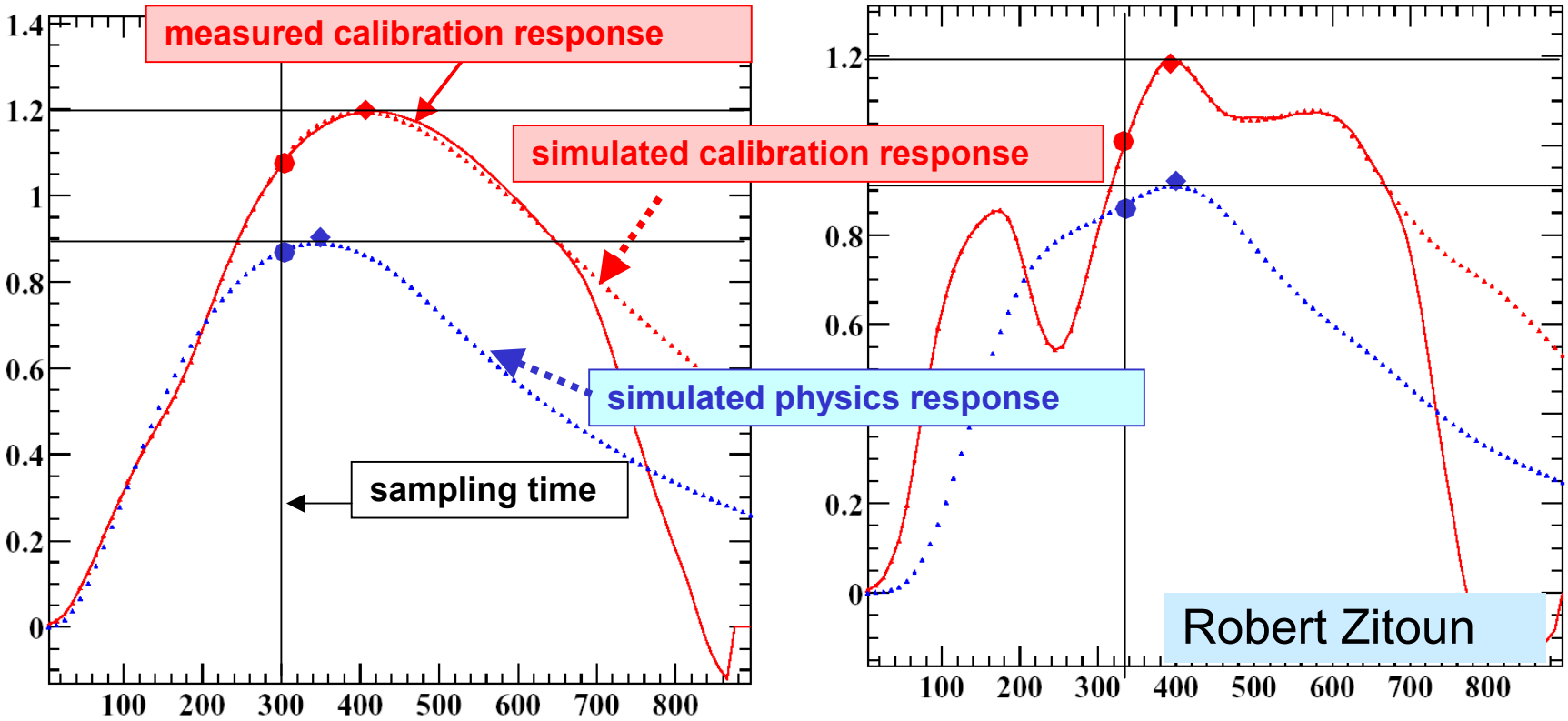
➔not to correct for non-uniformities of calorimeter cells

- **inject a precise calibration pulse and measure response for x8 and x1 gain-path**
- **correct for differences in slope and ratio x8/x1**

calibration corrections

A-type PreAmp:em

C-type PreAmp:had



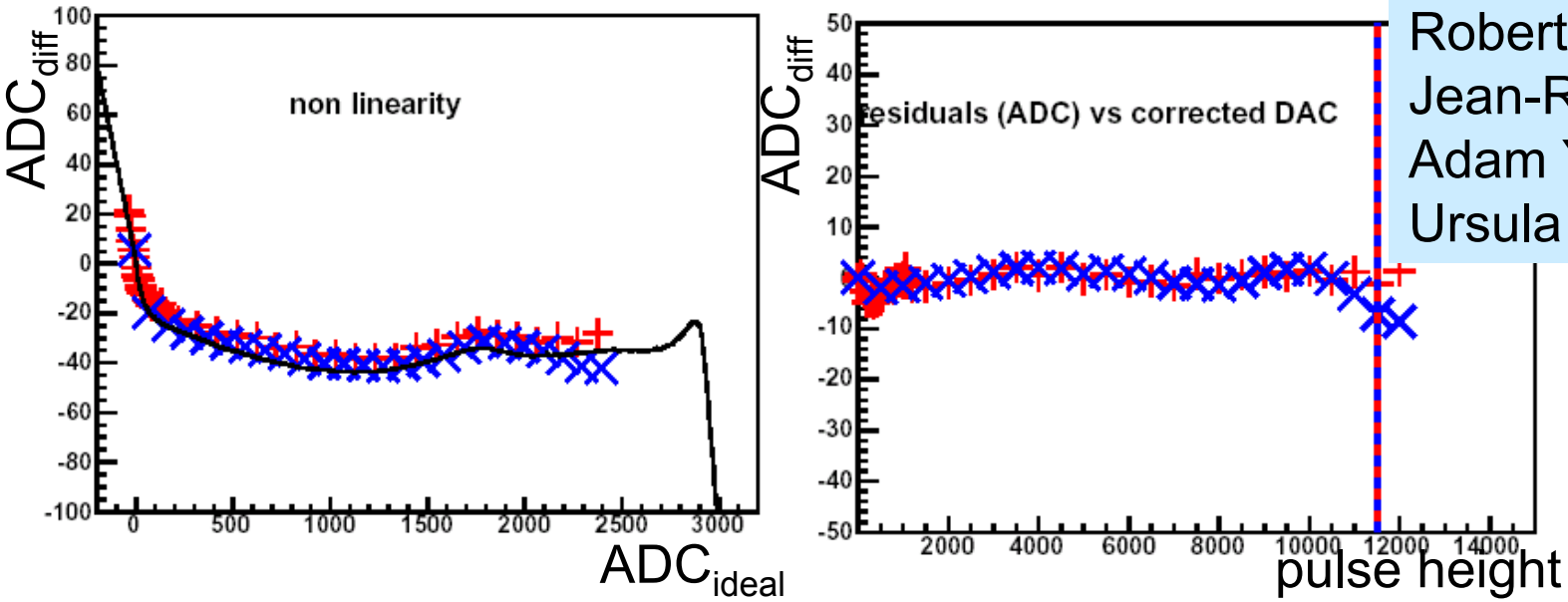
- **PULSER TIMING:** response at sampling time/maximal response
- **PHYSICS TIMING:** response at sampling time/maximal response
- **AMPLITUDE:** max pulser response/max physics response

gain/nlc coefficients

new and improved fit procedure for gain/nlc parameters:

➔ 1 additional nlc-parameter

➔ use of “pulser pattern” for calibration-data and correction of subsequent effects



Robert Zitoun
Jean-Roch Vlimant
Adam Yurkewicz
Ursula Bassler

- **first set of complete timing and response corrections**
  but: not fully understood yet!

interphi-calibration

➔ **transverse energy flow independent of φ**

em-interphi calibration:

- special run taken before shutdown

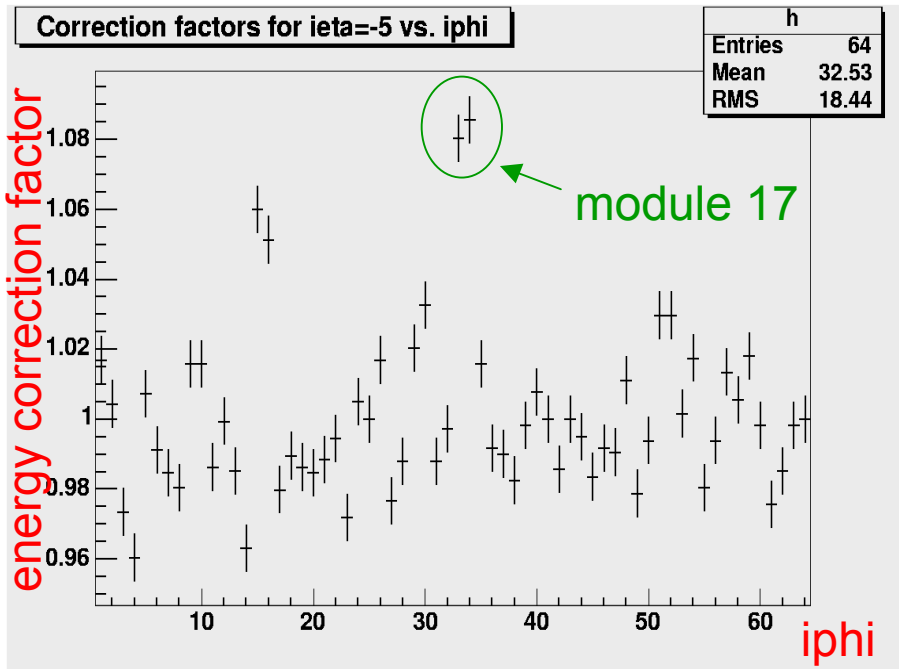
L1: CEM(1,6.)

L3: 8 GeV in one of 4 precision towers in the CEM(1,6) trigger tower

➔determine 1 correction factor per CAL tower (EM part)

➔have to be consistent with electronics calibration

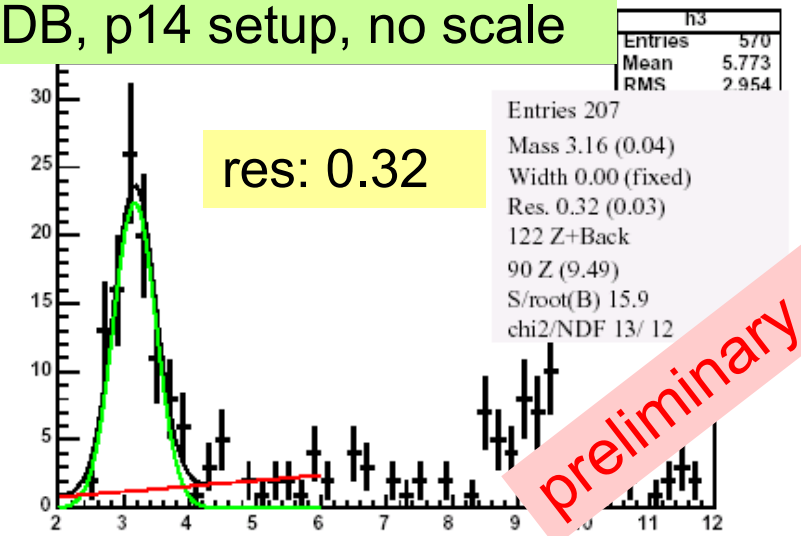
➔example at ieta = -5



Jan Stark, Marco Verzocchi, Matt Wettstein, Lei Wang

calibration from DB: J/Psi

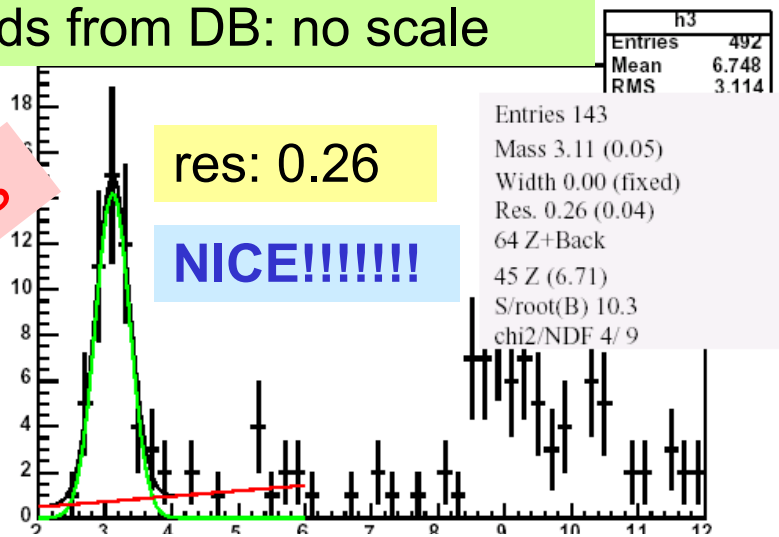
no DB, p14 setup, no scale



res: 0.32

preliminary results

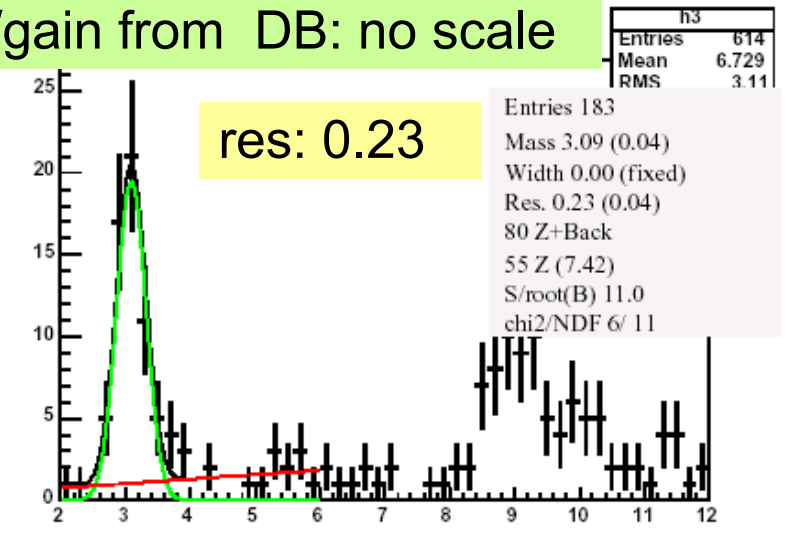
peds from DB: no scale



res: 0.26

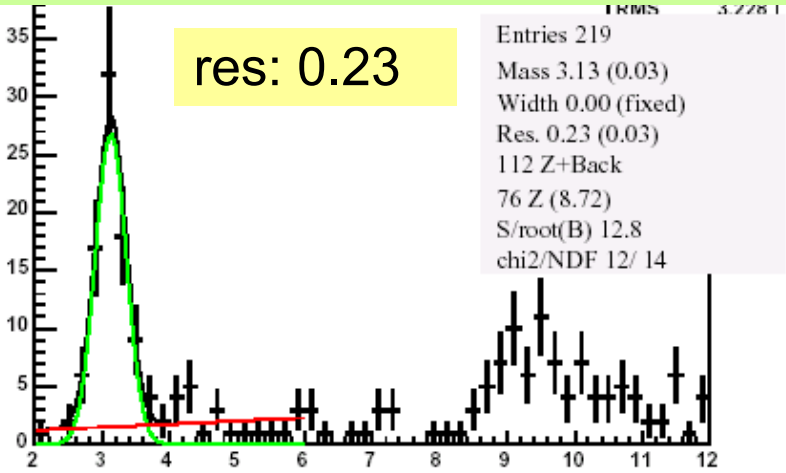
NICE!!!!!!!

nlc/gain from DB: no scale



res: 0.23

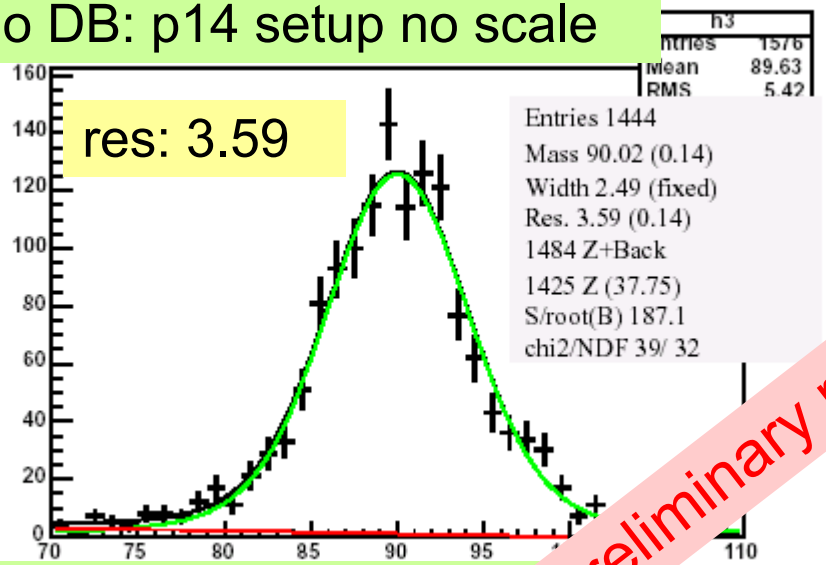
nlc/gain+corr+iphi DB: no scale



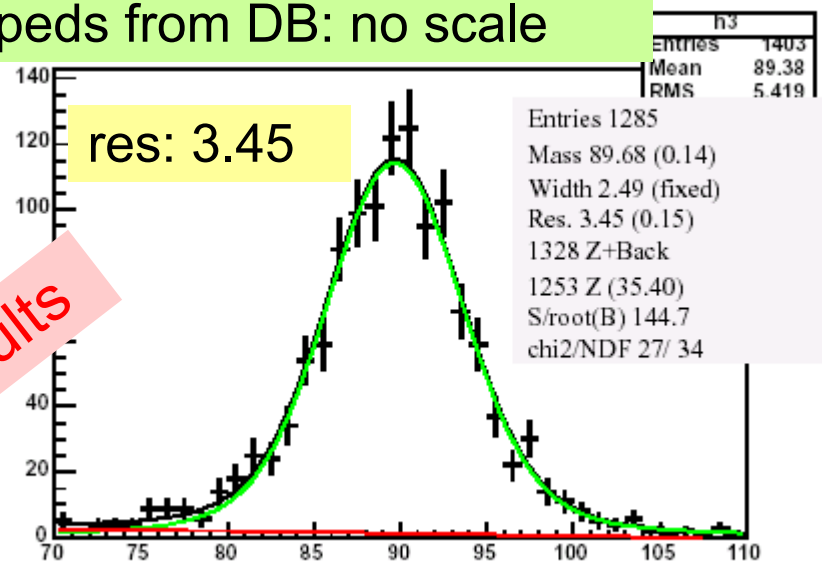
res: 0.23

calibration from DB: Z

no DB: p14 setup no scale

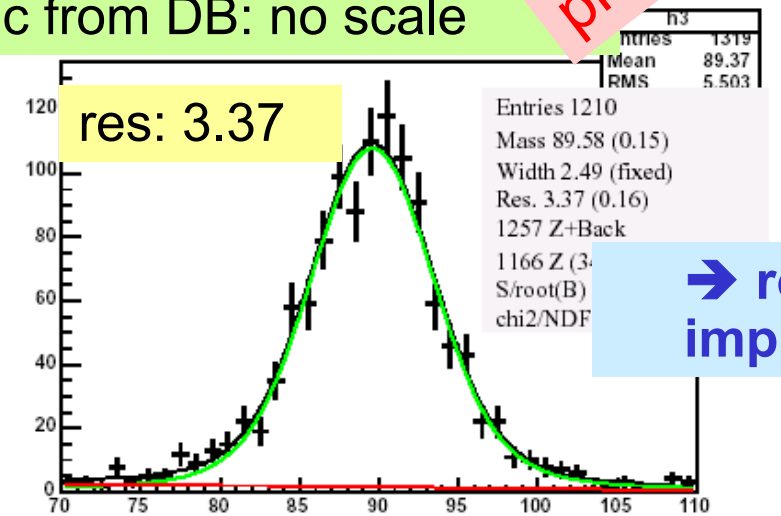


peds from DB: no scale

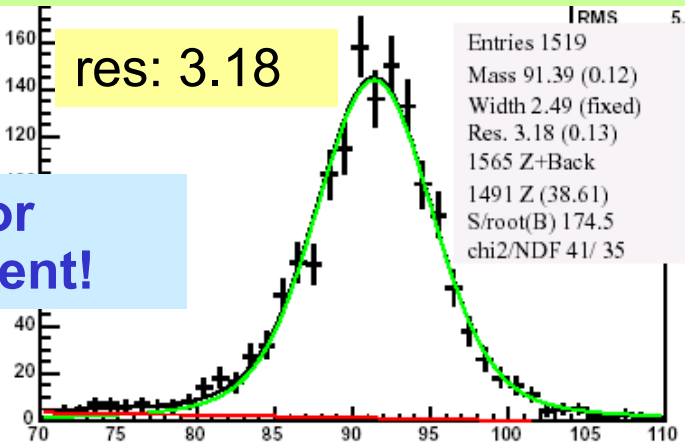


preliminary results

nlc from DB: no scale



nlc/gain+corr+iphi DB: no scale



➔ room for improvement!

“room for improvement”

- produce tmbs with different calibrations on full sample of picked J/Psi, Z and γjet-events
- use latest and greatest of NLC/GAIN coefficients
- try to improve timing and response correction for the electronics calibration (crucial)
- derive consistent set of interphi-calibration coefficients
- timescale: best we can get before reprocessing!
  beginning of January

➔ **doesn’t need any change in reco, only database is updated**

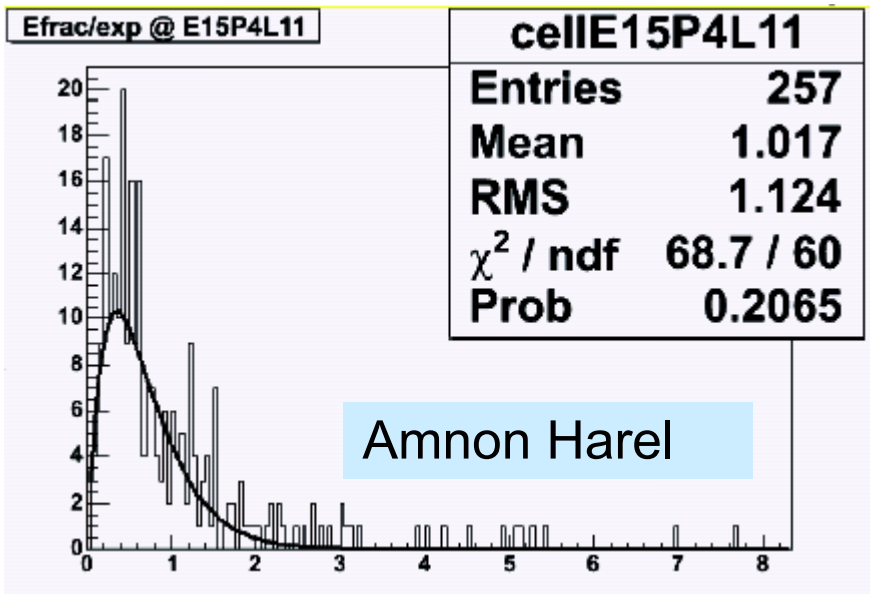
future of interphi-calibration

- include a new trigger for continuous, parasitic calibration data taking

➔modifications for L3, use of up to date calibrations

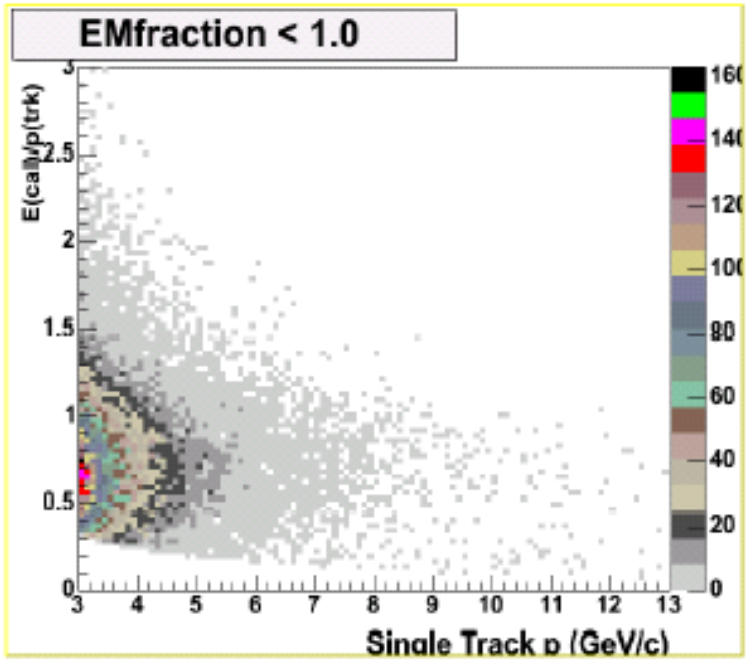
- extend calibration to FH-calorimeter
- inter-calibrate hadronic sections from jet-data:

  - for each cell in a jet: calculate the expected amount of energy based on the relevant jet profile and total jet energy
  - compare E_{obs} / E_{exp}



Single pion response

Ariel Schwartzman



Min bias and 0-bias events in pass2 data

Tracks are propagated to the calorimeter using full D0Propagator

p > 3 GeV, dca(z-vtx)<1cm

Compute calorimeter isolation and EM-fraction in a 3x3 and 5x5 road around the tracks.

E(5x5)-E(3x3) / E(3x3) < 1%

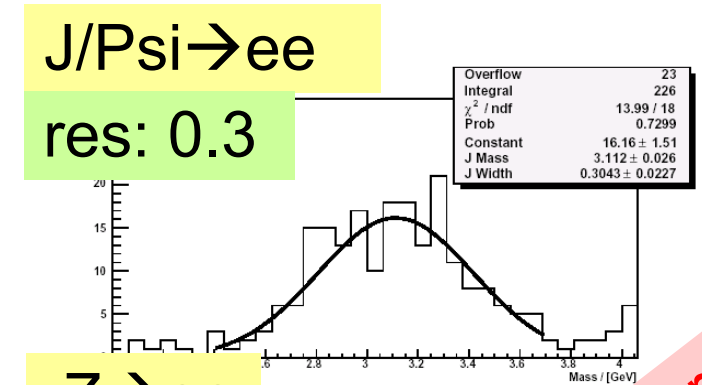
Ecal(3x3) > 1 GeV/c

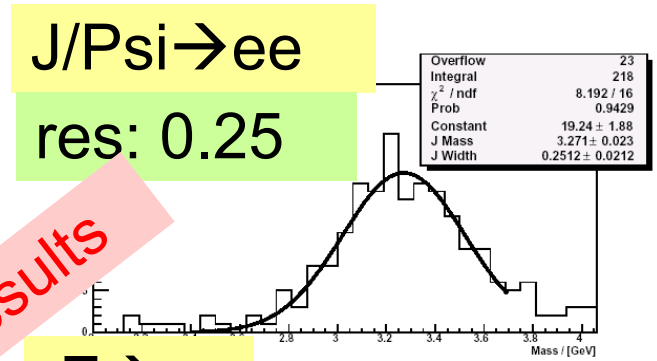
Require track isolation (DR>0.3)

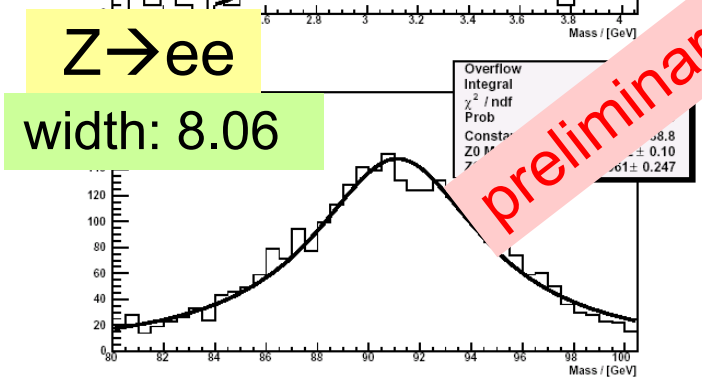
- very promising study!
- use of tau type I sample from tau-id group

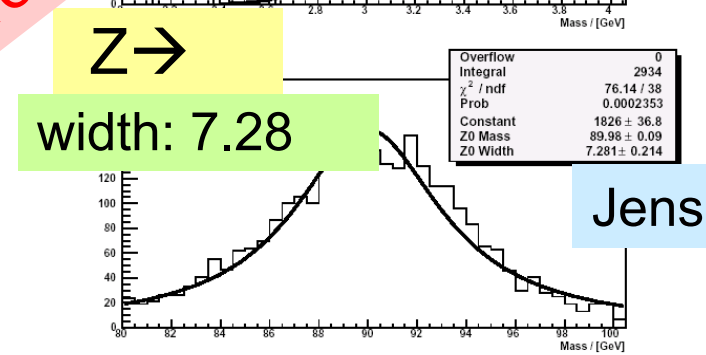
PreShower-calibration

- issue: derived corrections for CPS-strip saturation
- code developed for including CPS-energies in em-clusters, including adjustment of sampling weights









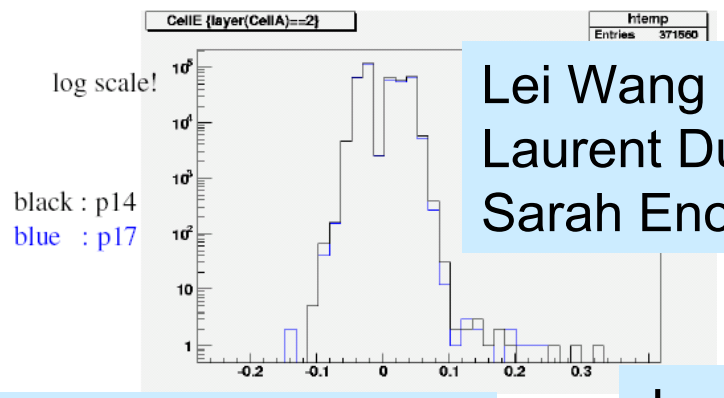
preliminary results

Jens Konrath

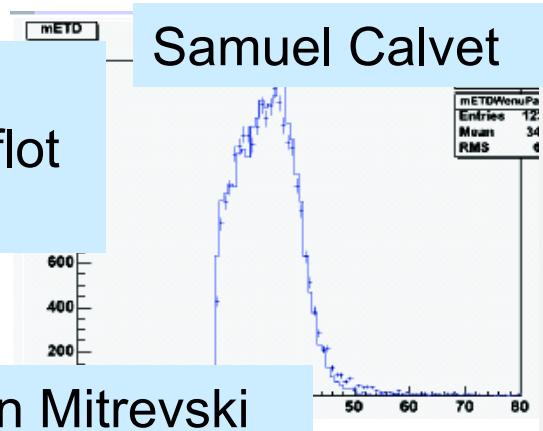
- **CPS:** new gain-calibration coefficients ready (Drew Alton, Alan Magerkurth)
- **FPS**: mapping close to final → pedestal calibration to DB, gain calibration coefficients expected (Jose Lazaflores, Ioannis Katsanos, Abid Patwa)

else:

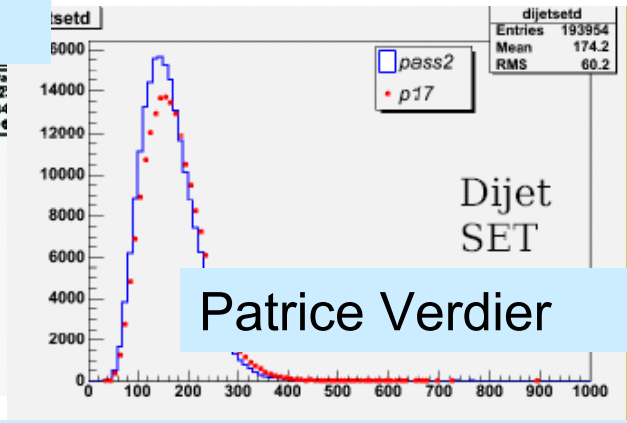
- verify p17 ➔data from 20pb^{-1} test available
- certification of pass 2 data
- improve and understand simulation



Lei Wang
Laurent Duflot
Sarah Eno

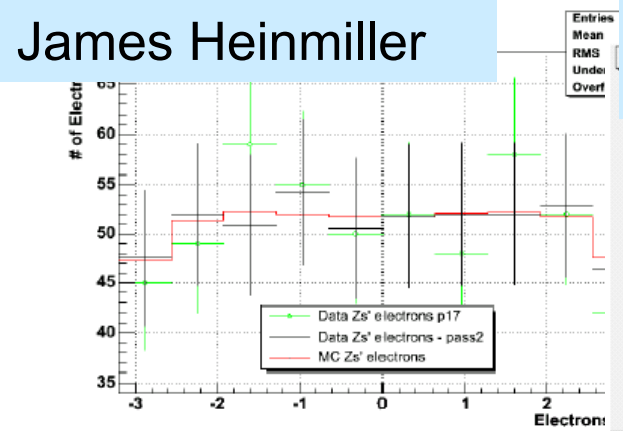


Samuel Calvet

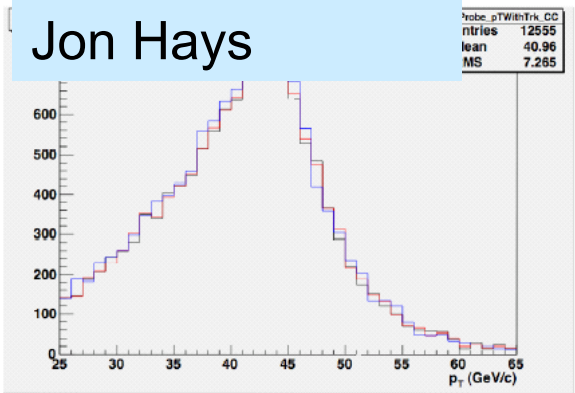


Patrice Verdier

James Heinmiller



Jovan Mitrevski
Jon Hays



Christian Schwanenberger